

Claims

What is claimed is:

1. An electric drive system, comprising:
 - a first engine;
 - a second engine;
 - a first electric generator adapted to be driven by the first engine and to generate a first output;
 - a second electric generator adapted to be driven by the second engine and to generate a second output;
 - an energy storage device adapted to receive the first output from the first electric generator and the second output from the second electric generator; and
 - an electric motor operatively connected to the energy storage device, the electric motor operable to generate mechanical power.
2. The system of claim 1, wherein the energy storage device is a battery.
3. The system of claim 1, wherein each of the first and second engines have a substantially similar torque output capacity.
4. The system of claim 1, wherein the first engine has preferred operational characteristics within a first range of rotations per minute and the second engine has preferred operational characteristics within a second range of rotations per minute, and wherein the first range of rotations per minute is greater than the second range of rotations per minute.
5. The system of claim 1, wherein the first engine has has preferred operational characteristics within a first torque range and the second

engine has preferred operational characteristics within a second torque range, and wherein the first torque range is greater than the second torque range.

6. The system of claim 1, wherein the first output of the first generator is greater than the second output of the second generator.

7. The system of claim 1, further including a heat exchanger operatively connected with the first engine and the second engine.

8. The system of claim 1, further including a transmission axle adapted to be driven by the electric motor.

9. The system of claim 1, further including a controller operatively connected with the first engine and the second engine, the controller adjusting the operation of the first engine and the second engine based on current operating conditions.

10. A method of operating an electric drive system, comprising:

applying a voltage from an electrical storage device to an electric motor;

operating a first engine to drive a first generator to supply electrical power to the electrical storage device under a first set of operating conditions; and

operating a second engine to drive a second generator to supply electrical power to the electrical storage device under a second set of operating conditions.

11. The method of claim 10, further including operating the first engine and the second engine to drive both the first generator and the second generator to supply power to the electrical storage device under a third set of operating conditions.

12. The method of claim 10, wherein the application of the voltage to the electric motor causes a rotation of an axle and a ground engaging device.

13. The method of claim 10, wherein the first engine and first generator are adapted to generate a first magnitude of electrical power and the second engine and second generator are adapted to generate a second magnitude of electrical power, the first magnitude being greater than the second magnitude.

14. A method of assembling a drive system, comprising:
providing a first engine and a second engine, the first and second engines having substantially similar torque output capacities;
tuning the first engine to have preferred fuel consumption characteristics at a first range of engine speeds and engine torques;
connecting a first electrical generator to the first engine, the first electrical generator having preferred operational characteristics at the first range of engine speeds and engine torques;
tuning the second engine to have preferred fuel consumption characteristics at a second range of engine speeds and engine torques;
connecting a second electrical generator to the second engine, the second electrical generator having preferred operational characteristics at the second range of engine speeds and engine torques;
connecting an electrical storage device to the first electrical generator and the second electrical generator; and
connecting the electrical storage device to an electric motor.

15. The method of claim 14, further including connecting the electric motor to a ground engaging device through a differential.

16. The method of claim 14, further including providing a controller adapted to control the operation of the first and second engines based on current operating conditions.

17. A vehicle comprising:
a ground engaging device;
a first internal combustion engine;
a second internal combustion engine;
a first electric generator adapted to be driven by the first engine and to generate a first output;
a second electric generator adapted to be driven by the second engine and to generate a second output;
an energy storage device adapted to receive the first output from the first electric generator and the second output from the second electric generator;
an electric motor operatively connected to the energy storage device, the electric motor operatively connected to the ground engaging device.

18. The vehicle of claim 17, wherein each of the first and second internal combustion engines have a substantially similar torque output capacity.

19. The vehicle of claim 17, wherein the first internal combustion engine has preferred operational characteristics within a first range of rotations per minute and the second internal combustion engine has preferred operational characteristics within a second range of rotations per minute, and wherein the first range of rotations per minute is greater than the second range of rotations per minute.

20. The vehicle of claim 17, wherein the first internal combustion engine has preferred operational characteristics within a first torque

range and the second internal combustion engine has preferred operational characteristics within a second torque range, and wherein the first torque range is greater than the second torque range.

21. The vehicle of claim 17, wherein the first output of the first generator is greater than the second output of the second generator.

22. The vehicle of claim 17, further including a heat exchanger operatively connected with the first internal combustion engine and the second internal combustion engine.

23. The vehicle of claim 17, further including a transmission axle disposed between the electric motor and the ground engaging device.

24. The vehicle of claim 17, further including a controller operatively connected with the first internal combustion engine and the second internal combustion engine, the controller adjusting the operation of the first internal combustion engine and the second internal combustion engine based on current operating conditions.